## DETAILED ACTION

### Remarks

In response to applicant's telephone inquiry on 8/12/2008 of the cited NPL reference of Baker not being sent with the previous Office action which cited the reference, the following corrective action is taken. The period for reply to the action has been restarted (e.g. to THREE MONTHS) to begin with the mailing date of this Supplemental Office Action. Copies of the following references not previously supplied are enclosed: Baker et al. ("The Windows 2000 Device Driver Book").

### Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/31/2008 has been entered.

Claims 1-30 and 32-36 are currently pending. All previously outstanding objections and rejections to the Applicant's disclosure and claims not contained in this Action have been respectfully withdrawn by the Examiner hereto.

### *Response to Amendment*

Applicants' amendments have overcome the previously outstanding rejections. However, upon a cursory search of the prior art, the Examiner has cited and applied the prior art references of Asco et al. and Baker et al. to teach the amended limitations of claims 1-14 and 28-36. Asco is being cited to show motivation and teach that RAID system can be comprised of physical disk while Bake is being cited to teach the common practice of device enumeration with a physical device object and a functional device object for each physical disk device connected to a system bus.

Applicants amendment to claim 15 has overcome all prior art rejection of claims 15-27. Claims 15-27 are now deemed allowable over the prior art of record.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 4, are rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782).

As per claim 1, Chatterjee teaches a **disk driver architecture wherein the architecture comprises:**

**A raid class driver** (pci.sys - figure 6) **including a first physical device object** (controller 1 PDO) **representing a RAID system** (controller 1 PDO represents a RAID system as the controller may be a RAID controller - ¶42) **comprised of a plurality of physical disks** (LD0-LD3 logical volumes are each comprised of a plurality of physical volumes - ¶36). In order for a system to be comprised of logical disks, it is necessarily inherent that the system be comprised of physicals disks, as it is well known in the art that logical disks are ultimately made up of collections or portions of physical disks.

Chatterjee teaches a RAID system comprising logical disks but does not specifically detail the interactions of the individual physicals disks and does not specifically teach a **plurality of functional device objects** (FDO) **each associated with one of the physical disks and adapted to interface with a second physical device object representing that physical disk**.

Asco teaches in figure 2 - [4/45 - 5/40] - that a RAID array 140 can be comprised exclusively of an array of physical disks 'P' instead of an array of logical disks as taught by Chatterjee. Such an arrangement is similar to that of Chatterjee in that both systems use a RAID filter driver as a functional layer between the disk objects and a user/host. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the RAID system of Chatterjee with the teaching of using physical disks to create a RAID system instead of logical disks. Such a modification would have achieved the predictable result of the use of physical disks instead of logical disks. As would have been known to one having ordinary skill, based on a user's preferences or need, coupled with the teachings of Asco, a collection of either logical disk or physical disks may comprise a RAID system.

Neither Chatterjee nor Asco teach each physical disk associated with a plurality of functional device objects interfaced with a physical device object that represents that disk, as claimed.

Baker teaches on page 166 under "The Role of Driver Layers in Plug and Play" that it is common in the art of physical disk drives where, during the device enumeration period, a plug and play manager will load both a physical device object (PDO), that represents a disk drive, and a functional device object (FDO), that handles functional operations for each disk. it would have been obvious to one having ordinary skill in the art at the time the invention was made to have further modified the RAID system of Chatterjee to incorporate the teachings of Baker in order to have properly initialized the physical disk drives 'P,' which comprise the RAID system 140 as shown in figure 2 of Asco, and made the drives ready for use by the system.

Figures 9.2 and 9.3 of Baker show that **the plurality of FDOs**, that correspond to each physical disk 'P' as shown by Asco, **are associated with one physical disk and are adapted to interface with a physical device object that represents that physical disk**.

Modified Chatterjee does not specifically teach **each second PDO providing a RAID-specific device identification.** Humlicek teaches a RAID-specific ID (DID 230 - figure 2) stored on each disk of a RAID system [6/63 - 7/6]. Thus it could have been seen by one of ordinary skill that the RAID-specific ID would have been obtained from the disk itself as it is stored on the disk, itself. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have further modified the RAID system of Chatterjee with the teachings of Humlicek In order to preserve the RAID configuration disk identification on the drives that represent the RAID system. Such a modification would have allowed the system of

Chatterjee to more flexibly identify disk drives associated with a group regardless of whether the drives have been transferred between different RAID systems. Further, such a modification allows the processing of host requests to occur as rapidly as possible, as the RAID-specific IDs of the disks allow for quick activation of the disk that represent a RAID system.

Finally, as shown with respect to figure 2 of Asco and figures 9.2. and 9.3 of Baker, **the first physical device object** (that represents the RAID system, which could be considered equivalent to the RAID filter 'R5' of Asco) **is attached with each FDO** (as teach FDO handles functionality for each disk 'P' as taught by Baker), **and wherein each FDO is associated with a different physical disk** 'P' as shown in element 140 of figure 2 of Asco.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Moore (U.S. Patent Application Publication No. 2004/0003135).

As per claim 2, modified Chatterjee does not specifically teach a disk controller enumeration. However, as discussed above and well known in the art of bus and device enumeration, Baker teaches that all devices on a bus are enumerated. Moore teaches a disk controller driver (elements 530 and 535) to interface with a disk controller (¶19 and ¶28). Thus the second PDO, which provides a RAID-specific device ID as taught above with reference to the Humlicek, is included in a disk controller driver to interface with a disk controller, as the second PDO is generated based on information gathered from the physical disk device that had

been attached to the system. The newly created second PDO is included on the device stack 500 (figure 5), or rather the disk controller driver.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the RAID system of modified Chatterjee with the disk controller enumeration teaching of Moore in order to have enumerated a disk controller object that is connected onto the bus that interfaces with the disk drive storage device. Such a combination would have produced the predictable result of a controller driver interfaced with a physical storage driver.

As per claim 4, the RAID class driver of Chatterjee combines each physical disk into a RAID system as Chatterjee teaches in ¶42. The controller on the PCI bus may be a RAID controller and thus the disks would therefore be a RAID system. Further, Asco shows the RAID filter "R5" of element 140, figure 2, being used to create element 140 as a RAID system.

Claims 3,28,29, and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Merkey (U.S. Patent Application Publication No. 2003/0070043).

As per claim 3, modified Chatterjee does not specifically teach the first PDO representing a RAID system is adapted to provide a standard disk device ID to an operating system. Merkey teaches in ¶76 logic to provide the RAID system of disks to a processor [e.g. the operating system] as a single disk device ID. Representing the entire RAID as a single disk would have

allowed for a user to store data redundantly while hiding the redundancy disks and organization from the user, thereby simplifying the RAID interaction for a user. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have combined the RAID system of Chatterjee with the teaching of single drive RAID identification of Merkey in order to have simplified the data redundancy of the system of Chatterjee for a user who wishes to protect data.

As per claim 28, relying on the combination of references and motivation as discussed above with relation to claim 1, Humlicek teaches **receiving a RAID-specific ID for each physical disk of the RAID system** (DID 230 - figure 2 - [6/63 - 7/6]), where the RAID system is the combination of all the logical disks LD0-LD3 and the physical storage disks they represent (¶36), **binding a respective RAID specific functional interface** (each disk in a group of disks has its own FDO as taught by Baker in figures 9.2 and 9.3 - as the disks are part of the RAID system, the Examiner is therefore considering the FDO of each disk to be a RAID-specific functional interface) **to each disk having a RAID-specific device ID** (as all of the disks are being considered by the Examiner to be part of the RAID system as shown in figure 6 of Chatterjee), **binding all of the RAID-specific functional interfaces to a same disk object representing the entire RAID system** (all FDOs of the disk are connected to the controller 1 PDO as shown in figure 6 of Chatterjee - controller 1's PDO represents the entire RAID system as it is shown as being the only component connected to the RAID disks).

Modified Chatterjee (as discussed in claim 3 above) teaches **providing an OS with a standard disk device ID via the disk object** - Merkey ¶76.

As per claim 29, the **RAID-specific device ID is received from one or more disk controllers** (as discussed below with respect to claim 15, disk controller 0 may interface with a portion of the plurality of disks, and since a disk access is required to obtain the RAID-specific information as taught by Humlicek, the disk controller therefore enables that access as the disk controller communicates with the portion disks), **wherein each disk controller is adapted to interface with at least a portion of the plurality of physical disks** (as discussed).

As per claim 32, **the RAID class driver** (PCI.sys) is **initialized in response to identification of a RAID controller** (controller 1 - ¶42). Device enumeration is well known in the art; therefore, upon detection of the RAID controller on the pci bus, the system of modified Chatterjee would have loaded the RAID class driver to enable communication with the RAID controller.

As per claim 33, **the RAID controller comprises hardware** as shown with respect to ¶42 and figure 2 (element 220) of Chatterjee.

As per claim 34, a standard disk driver object (PDO) is loaded to interface with the disk object (¶42 of Chatterjee) thereby enabling transparent access to the RAID system as the entire RAID volume may be visible as a single logical drive (¶76 of Merkey).

Claims 5-10 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Lu (U.S. Patent Application Publication No. 2004/0073747).

As per claim 5, mirroring data is well known in the art of RAID as RAID-1 implementation. Modified Chatterjee does not specifically teach using a RAID-1 implementation to mirror data requested to be written to a disk. Lu teaches a RAID system is adapted to mirror a written data block on at least a portion of the plurality of disk (such as group comprising LD3-LD4 of Chatterjee), as a disk group may be organized as RAID level 1 (¶35), which is also known as RAID mirroring - ¶8. The functional device objects for the associated disk drives would have been utilized as the FDOs represent the disk drive to the function driver (figures 9.2 and 9.3 of Baker), which in turn is responsible for providing a software interface to the particular device and is called for transferring data, such as during a mirroring write operation. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to have further modified the RAID system of Chatterjee to have implemented a RAID-1 system as taught by Lu. Mirroring would have implemented a layer of data redundancy to prevent a loss of data.

As per claim 6, a first and second write request of data blocks may be made to different portions of the plurality of disks during a striped write when the disk drive group is configured as a RAID-0 system (¶7 and ¶35 of Lu). The FDOs would have been utilized to perform the writing as discussed above in the rejection of claim 5.

As per claim 7, in response to receiving a request to write a first and second data block to a plurality of physical disks (such as the physical drives 'P' of the RAID group of figure 2 of Asco), the RAID driver is adapted to write via the FDOs an error correction (parity) block to a portion of the plurality of disk when the disk drive group 138 is configured as a RAID-5 system (¶35 of Lu). RAID-5 incorporates parity calculation for data redundancy - ¶9 of Lu. The FDOs

for the respective disks to be written to would have been utilized to perform the writing of the parity block as discussed above in the rejection of claim 5.

As per claim 8, the RAID controller would comprise both a RAID controller FDO and a RAID controller PDO as controller drivers are enumerated as such as shown in figure 9.2 of Baker (as each device on the bus would have a FDO and PDO). Chatterjee shows in figure 5 a controller FDO in Controller 0's miniport driver 506 interfaced to a controller PDO within PCI driver 510. The PDO representing the RAID system (i.e. controller PDO - figure 6 of Chatterjee) would therefore be seen as a child of RAID controller's FDO in the driver layer hierarchy of the system of figure 6 of Chatterjee as in order to implement the drive itself as a RAID drive.

As per claim 9, Humlicek teaches **RAID configuration data stored in computer system configuration memory** (e.g. a portion of each respective RAID drive - [6/67 - 7/6].

As per claims 10, Chatterjee teaches that a first portion of the plurality of disks (LD2-LD3) is associated with a first disk controller (RAID controller 1 - ¶42) and the second potion of the plurality of disks (LD0-LD1) may be associated with a second disk of a second type controller (SCSI controller 1 - figure 2).

As per claim 13, Chatterjee does not specifically teach the second type of controller being for an external disk; however, Lu teaches a second controller 110 can be used for external disks (iSCSI controller 106).

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al.

(*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Lu (U.S. Patent Application Publication No. 2004/0073747) in further view of Frank et al. (U.S. Patent Application Publication No. 2004/0160975).

As per claim 11, modified Chatterjee discloses a SCSI controller and a RAID controller for the first and second controllers (figure - 2), but fails to specifically disclose an EIDE controller.

Frank teaches an EIDE controller (¶7). It would have been obvious to one of ordinary skill in the art to have used the EIDE controller taught by Frank in the RAID control system of Chatterjee because both inventions involve methods of controlling a RAID system using various controller and disk types and the EIDE taught by Frank et al. is an improvement over the standard IDE disclosed by Chatterjee.

As per claim 12, Frank teaches the first type of controller being a serial ATA type controller and the second type being a parallel ATA type (¶7).

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Brantley Jr. et al. (U.S. Patent No. 5,163,149).

As per claim 14, modified Chatterjee does not teach the RAID class driver being adapted to optimize data access by combining separate data access operations associated with a disk of

the RAID system into a single data access operation. Brantley teaches such a concept in [1/24-29]. It would have been obvious to one of ordinary skill in the art to have combined the access combination of Brantley with the RAID control system of Chatterjee because both systems involve access to a memory and the combined access method improves the access time (Brantley - [1/32-39]).

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Merkey (U.S. Patent Application Publication No. 2003/0070043) in further view of Frank et al. (U.S. Patent Application Publication No. 2004/0160975).

As per claim 30, Chatterjee teaches using a SCSI controller (¶42) for the first controller but fails to teach the second controller (¶32) is of a second type. Frank teaches an EIDE controller may be used to access disks (¶7). It would have been obvious to one of ordinary skill in the art to have used the EIDE controller taught by Frank in the RAID control system of Chatterjee because both inventions involve methods of controlling a RAID system using various controller and disk types and the EIDE taught by Frank et al. is an improvement over the standard IDE disclosed by Chatterjee.

Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows®

*2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Merkey (U.S. Patent Application Publication No. 2003/0070043) in further view of Rezual Islam et al. (U.S. Patent No. 6,282,670).

Modified Chatterjee does not specifically teach the **RAID-specific IDs are obtained from a CMOS configuration**. Rezaul Islam teaches that the same RAID configuration data that is stored in each disk drive can also be stored in a nonvolatile RAM for keeping track of changes to the disk drive devices and the configuration [7/38-65]. The RAID controller utilizes the CMOS to initiate the system based on updated configuration data [8/32-53]. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used a CMOS memory to store the configuration data in order to have been able to store the configuration data locally to the RAID controller. By storing the configuration data only on the disk drives themselves (as described by Humlicek) would not have allowed the system of modified Chatterjee to have accessed the configuration during system initialization for the POST routine ([8/32-53] of Rezaul Islam).

Claims 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chatterjee et al. (U.S. Patent Application Publication No. 2004/0024962) in view of Baker et al. (*The Windows® 2000 Device Driver Book*) in further view of Asco et al. (U.S. Patent No. 7,174,538) in further view of Humlicek et al. (U.S. Patent No. 5,822,782) in further view of Rezual Islam et al. (U.S. Patent No. 6,282,670).

Modified Chatterjee does not specifically teach the **RAID-specific IDs are obtained from a CMOS configuration**. Rezaul Islam teaches that the same RAID configuration data that is stored in each disk drive can also be stored in a nonvolatile RAM for keeping track of changes to the disk drive devices and the configuration [7/38-65]. The RAID controller utilizes the CMOS to initiate the system based on updated configuration data [8/32-53]. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have used a CMOS memory to store the configuration data in order to have been able to store the configuration data locally to the RAID controller. By storing the configuration data only on the disk drives themselves (as described by Humlicek) would not have allowed the system of modified Chatterjee to have accessed the configuration during system initialization for the POST routine ([8/32-53] of Rezaul Islam).

***Allowable Subject Matter***

Claims 15-27 are allowable over the prior art of record.

The following is a statement of reasons for the indication of allowable subject matter:

As per claim 15, the prior art of record does not teach alone or in combination the claim limitations as a whole. Specifically, the prior art does not specifically teach a RAID controller that is to induce the loading of a RAID driver that is to represent a RAID system comprised of a plurality of disk and then not having that RAID controller interface with any of the disks comprising the RAID system. Applicant's specification mention this concept as a "phantom" RAID controller in ¶30. Such a concept is not taught by the prior art of record.

### *Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Dake et al. (U.S. Patent No. 7,139,693) teaches a RAID system that comprises RAID objects consisting of disk objects, array objects, volume objects, and controller objects - figures 4 and 6.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHANE M. THOMAS whose telephone number is (571)272-4188. The examiner can normally be reached on M-F 8:30 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt M. Kim can be reached on (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Shane M Thomas/ 13 March 2008
Primary Examiner, Art Unit 2186

Shane M. Thomas